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Quality of COPD care in hospital outpatient clinics in Denmark: The KOLIBRI study

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Summary
Background: We studied the quality of care for COPD patients in 22 hospital-based outpatient clinics in Denmark and evaluated if participation by the staff in an educational programme could improve the quality of care and adherence to the COPD guidelines.
Methods: We performed two audits of the hospital records one year apart before and after the educational programme for the participating doctors and nurses. A total of 941 patient records were included in the first audit and 927 in the second. The indicators of quality of care comprised amongst others referral to pulmonary rehabilitation, smoking cessation advice, nutritional advice, instruction in inhalation technique and assessment of BMI, smoking status, pack years, lung function parameters, dyspnoea oxygen saturation and co-morbidities.
Results: In general, the quality of care for COPD patients in Denmark was suboptimal and not in accordance with the recently published guidelines both in the 1st and the 2nd audit. Yet, we observed a substantial improvement from the 1st to the 2nd audit. For example, referral to rehabilitation improved from 56.3 to 62.7% ($p = 0.006$) Assessment of BMI improved from 7.8 to 56.1% and assessment of dyspnoea using MRC dyspnoea scale increased from 7.2 to 47.2% (both $p < 0.001$). When analysing the results with focus on the performance of the individual outpatient clinics we also observed an improvement in the quality.
Conclusion: We conclude that it is possible to improve the quality of care for COPD by focusing on a more systematic approach to the patient assessment by education of the staff

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of the outpatient clinics. A repeated and continuous education and discussion with the clinical staff is probably essential to reach an acceptable level of the quality of care for outpatients with COPD.

Introduction

It is assumed that there are around 400,000 individuals with COPD in Denmark. Approximately 40,000 have severe COPD, defined by forced expiratory volume in 1 s of expiration (FEV_1) below 50% of the predicted value.[1] The diagnosis and treatment of COPD requires large resources both in the primary sector and in the hospitals. In 2001, there were app. 23,000 hospital admissions and 33,000 outpatient visits in Danish hospitals due to COPD.[2] A publication from the Danish Institute for Health Services Research showed that the net cost of treating COPD patients in 2002 (excluding costs of the medication) was around 250 million Euros, which is equivalent to about 6% of total hospital and health insurance costs in Denmark.[3]

It is important for COPD patients to be diagnosed correctly and to receive an updated and evidence-based treatment. There are many international COPD guidelines that the physicians may choose from including those from ERS/ATS and GOLD.[4,5] The Danish Board of Health has also published national recommendations on the early diagnosis, follow-up and rehabilitation of patients with COPD.[6]

A recent quality assurance project in the primary sector comprising 154 general practices across Denmark has clearly shown that such projects can optimise the quality of diagnosis and treatment of COPD.[7] The aim of the present study was twofold. Firstly, we wished to describe the quality of COPD care in Danish hospital-based outpatient clinics. Secondly, we wanted to investigate if an educational programme on COPD guidelines involving the staff of the participating departments was able to improve the quality of care.

Methods and materials

The study design comprised two cross sectional audits of the hospital outpatient records of all COPD patients, who visited the clinics for a COPD-consultation in October–December 2005 (*first audit*) and in October–December 2006 (*second audit*). Both first time referrals and patients who had previously been assessed at the clinics (follow up consultations) were included in the two audits. The audits were performed retrospectively by analysing the available hospitals records in a consecutive order during the time periods defined above. We developed a case record form (CRF), which had to be filled in by the investigators on the basis of available information recorded at the particular outpatient visit during the study period. If the information requested in the CRF was not available in the hospital records, a missing value was registered, as no additional investigations of the patients were allowed in order to complete the CRF. The CRF consisted of several questions including information on following items: Referral to rehabilitation programme (if not already carried out), calculation of patients body mass index (BMI), assessment of need for dietary/physiotherapy intervention, evaluation of breathlessness with Medical Research Councils dyspnoea scale (MRC-score) or other scales, measurement of oxygen saturation in the blood by means of pulse oxymetry, measurement and calculation of FEV_1 in the % of the predicted value, antismoking advice for smokers, checking of patients inhalation technique and review of the medical treatment. All 33 Danish hospitals with pulmonary outpatient clinics were invited to take part in the study and 22 departments agreed to participate. ***The first audit*** was performed during winter 2005/6 and included 941 patient records. Each department had to include 30-50 consecutive patients. The participating staff (a doctor or a nurse) filled in the CRF on the basis of information from the patient hospital record from the audited visit. The exclusion criterias were: Asthma without coexisting COPD and any co-morbidity that hampered the diagnosis and treatment of COPD, e.g., malignant disease, dementia or sequelae from a cerebrovascular stroke.

The second audit, which took place exactly one year later, was carried out according to the same principles and with the same procedures for data collection.

In between the two audits, the staff of the involved departments participated in an educational program on COPD consisting of a regional meeting, and one local meeting at the department level including workshops with training and discussion on the evidence-based diagnosis and treatment of COPD. In particular, the rationale for the assessment of different aspects of COPD was discussed including different documentation tools like forms that could be filled in during the consultation. In addition a nurse from each department completed an advanced course on COPD and passed the examinations. The course was the diploma level course from ''the Education for Health'', Warwick, UK with accreditation from ''The Open University'', Birmingham, UK (www.educationforhealth@org.uk).

Statistics

Our aim was to include at least 20 departments, with 30–50 patient records each, resulting in app. 600–1000 cases per audit. Bivariate comparison of sample demographics at 1st and at 2nd audit was done by *t*-test for quantitative outcomes and by contingency table test for categorical outcomes. In all analyses a 5% significance level was applied.

The presence of information on the selected indicators (e.g., BMI) was defined as an indicator of good quality, and treated as the primary outcome in the statistical analysis. The effect of participation in KOLIBRI was measured in terms of change in presence of information from the 1st to

the 2nd audit on the selected indicators. Since the data in the analysis came from hospitals (strata) of different sizes, we estimated overall change in presence of information by weighted estimation, i.e., each observation being weighted by the inverse of its sampling probability. This implies that each hospital contributes to the estimated effect proportional to its yearly number of hospital outpatient visits. Similarly, variance estimates were obtained by weighted estimation, so that confidence intervals for change in presence of information reflect the variation within and between hospitals. Whenever estimated 95% confidence intervals did not include zero, it was interpreted as a significant change in presence of information. In all analyses, the statistical software R[8] was applied. The package survey was used for performing weighted estimation and confidence intervals for change in presence of information.

The KOLIBRI project was approved by The Danish Data Protection Agency.

Results

Table 1 shows the general characteristics of the COPD patients included in the 1st and the 2nd audit. The slight majority were women: 55% in the first and 56% in the second audit. The mean age was 69 years. The mean FEV_1 in % of predicted was around 44 and most of the patients had severe or very severe COPD. Approximately one in seven was on oral corticosteroids or on home oxygen treatment. We observed some differences between the severities of COPD, across the participating departments, but this did not change between the two audits.

Table 2 reports the results of the two audits, by showing the presence of relevant information in the hospital records for the indicators of quality of care for the total population. We observed significant improvements from the 1st to the 2nd audit in all indicators except for smoking cessation advice, which was already high at the 1st audit. In particular, the presence of information on BMI improved from 7.8% in the 1st to 56.1% in the 2nd audit, and the information on MRC dyspnoea scale increased from 7.2 % in the 1st to 47.2% in the 2nd audit. With regard to referral to pulmonary rehabilitation, the improvement, although statistically significant, was numerically only modest (56.3% in the 1st audit to 62.7% in the 2nd audit ($p = 0.006$)).

In addition to focusing on the average performance based on all the included records, we also performed analyses focusing on the performance of the single participating hospital clinic. Statistically the clinics could improve their quality or not improve it significantly. Following results were obtained for the individual indicators: BMI: 17 clinics improved and 5 did not improve; MRC dyspnoea: 18 improved and 4 did not; pulse oxymetry: 3 improved and 19 not; FEV_1: 5 improved and 17 did not improve; inhalation check: 10 improved and 12 did not

Table 1 General characteristics of all the COPD patients included in the 1st ($n = 941$) and 2nd audit ($n = 927$).

Characteristic	Audit 1 $n = 941$	Audit 2 $n = 927$	p-value
Gender (Women %)	55%	56%	NS
Age, years (Mean with SD in parenthesis)	69.2 (10.7)	68.5 (10.3)	NS
BMI, kg/m^2 (Mean with SD in parenthesis)	24.1 (5.5)	25.2 (5.5)	NS
No of tobacco pack years (Mean with SD in parenthesis)	36.6 (20.5)	41.9 (21.7)	NS
Current smokers, %	29.2%	32.1%	NS
FEV_1 in % predicted (Mean with SD in parenthesis)	43.6 (17.7)	45.1 (18.5)	NS
Severity assessed by spirometry 1			
Mild, %	(2.3%)	(3.3%)	NS
Moderate, %	(30.5%)	(33.1%)	
Severe, %	(39.8%)	(39.1%)	
Very severe, %	(27.2%)	(24.5%)	
MRC dyspnoea score			
1	(11.7%)	(4.6%)	NS
2	(14.1%)	(16.1%)	
3	(39.7%)	(35.7%)	
4	(25.0%)	(34.6%)	
5	(8.8%)	(8.9%)	
Medical treatment			
Short acting bronchodilator	72.4%	81.7%	<0.001
Long acting bronchodilators	74.8%	86.7%	<0.001
Oral bronchodilators	3.4%	4.3%	NS
Inhaled corticosteroids	71.7%	78.5%	<0.001
Oral corticosteroids	13.7%	12.1%	NS
Mobile Oxygen	10.9%	11.2%	NS
Stationary Oxygen	13.3%	12.6%	NS

Table 2 Presence of information on specific indicators of quality of care in the hospital records at the 1st and 2nd audit.

Variable	Audit 1 Information present	Audit 2 Information present	*p*-value
Height	84.8%	93.9%	<0.001
Weight	51.3%	75.1%	<0.001
BMI	18.8%	56.1%	<0.001
Current smoking status	82.0%	93.5%	<0.001
Pack years	35.3%	47.4%	<0.001
FEV_1 in % of predicted	78.4%	91.4%	<0.001
FVC in % of predicted	76.2%	88.8%	<0.001
MRC dyspnoea grade	7.2%	47.2%	<0.001
Assessment of oxygen saturation with pulse oxymetry	71.0%	78.4%	<0.001
Smoking cessation advice given to current smokers	90.0%	92.0%	NS
Referral to pulmonary rehabilitation	56.3%	62.7%	$=0.006$
Nutritional advice given if relevant	26.1%	47.4%	<0.001
Inhalation technique checked	18.7%	39.8%	<0.001

improve and finally smoking cessation advise, where none of the clinics obtained a significant improvement. None of the participating clinics worsened their performance with any of the indicators.

We observed a considerable variation between the participating clinics. Thus, in order to obtain a more correct estimate of the impact of the KOLIBRI project on the total Danish population of COPD outpatients, both with regard to bias and precision, we performed a weighted analysis, taking into account the total number of COPD patients attending the individual clinics a year. These weighted estimates of the main indicators are shown in Fig. 1, where both a relative and an absolute improvement are given. Regarding the referral to pulmonary rehabilitation, we also observed a significant increase from the 1st to the 2nd audit (Table 1). In the weighted analysis, however, this improvement was non significant, mainly due to considerable variation between hospitals, 95% CI (−2%; 22%).

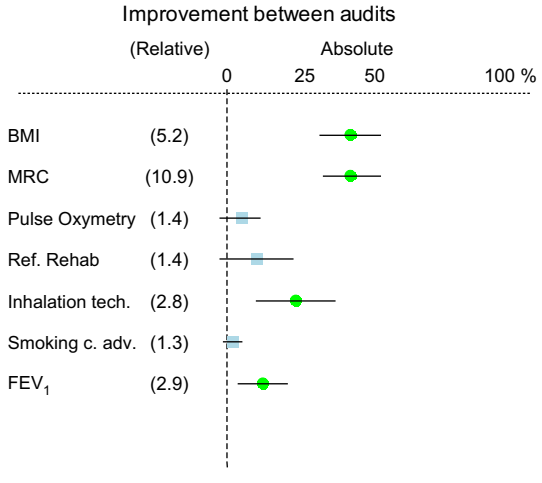

Figure 1 Improvements in patient information (%) for the primary end points from weighted analysis. Both relative (odds ratios) and absolute improvements are given. Green circles denote a statistical significant improvement while blue square denote no statistical significant improvement (unchanged).

Discussion

Our study shows, that although the quality of care for COPD patients in hospital based outpatient clinics across Denmark is not optimal, a substantial improvement was achieved during the KOLIBRI project.

As expected, our study comprises patients, who have more severe COPD in comparison with patients included in a similar Danish COPD study in general practice (KVASIMODO).[7] More than 50% of the patients in the present study had severe or very severe COPD, whereas this was the case for app. 40% of the patients in the KVASIMODO study. We think, that the study population is representative of Danish outpatients with COPD. The slight majority were women, which reflects a very high prevalence of smoking and COPD among Danish women.[9] Although app. 11 of Danish hospitals did not participate, we have no reason to believe that these hospitals took care of patients, which differ from the patients included in the present study, because these hospital do not differ from the participating hospitals with regard to size or referral type (primary or secondary hospitals).

In general, the hospital clinics performed better than the GPs with regard to most of the indicators.[7] This is not surprising and is in keeping with finding from a Spanish study, where the patients controlled by the pneumonologist more often received non-pharmacological and pharmacological treatment and had a better inhalation technique than those controlled by a general practitioner.[10]

Our methodology is based on an audit of the information that was documented in the patient records. We cannot be certain that all the documented procedures actually took place and *vice versa* the fact that a procedure was not documented does not imply that it did not took place. Yet, we believe that our audits give a good insight into the quality of COPD care, as we anticipate, that the content of the patient file at least to some degree reflects the content

of the consultation. It is a part of good clinical practice to document the content of the consultation in the patient record. However, it is likely that some aspects of the consultation (e.g., information on need of physical exercise and/or on inhalation technique) have not been documented in the hospital records, although they have been dealt with during the consultation, although it is less likely for quantitative measurements like MRC dyspnoea score and BMI. The improved documentation practice is much more likely to be the case in the records included in the 2nd audit, since the participating departments were aware of the 2nd audit and undoubtedly improved their documentation routine. Thus, we think that the overall improvement from the 1st to the 2nd audit, is caused both by a genuine improvement in the quality of care and an improvement of the documentation.

The particular clinical indicators were chosen from the guidelines because they describe important clinical aspects of COPD including disease severity, complications, educational aspects, non-pharmacological and pharmacological treatment. We anticipate that acting according to the guidelines will result in an improved clinical outcome in the long run. However this aspect was not possible to investigate using present design as we do not have information on whether the patients followed the advice given at the consultations.

In addition to describing the care of COPD patients in Danish hospitals, we wanted to investigate if an educational program addressing the hospital staff can improve the quality of care. The method of evaluation was an internal audit and although some cross checking was done on a random sub sample of the cases, we cannot exclude ''observer bias'' since the hospital staff completed the CRFs themselves. The data were analyzed in several ways: firstly, with focus on the overall quality at the patient level (all clinics combined) and secondly with the focus on the single hospital clinic. In general, both analyses showed an improvement, but the improvement was most pronounced at the patient level. This was caused by a skewed distribution of the quality between different clinics, with relatively little room for improvement in many of the clinics. Our study covers app. 2/3 of all Danish hospital based pulmonary outpatient clinics and we believe that our findings are representative for Denmark. The cases across different departments were not entirely homogeneous with regard to COPD severity and therefore we performed an additional weighted analysis, which took into account the number of the patients attending each of the participating hospital clinics (Fig. 1).

One of our goals was to promote referral to pulmonary rehabilitation. This important indicator improved from the 1st to the 2nd audit, but the improvement, although statistically significant, was relatively modest compared with some of the other indicators. Although we are aware of the fact that the capacity of pulmonary rehabilitation in Denmark has increased between the two surveys, the modest improvement is most likely to reflect the fact that that the capacity is still to low.

We conclude that the quality of care for COPD patients in Danish hospital based outpatient clinics can be improved substantially by using an educational program based on current COPD guidelines. Although our study design was open to observer bias and this may overestimate the effect of the educational program, we think that our results can be extrapolated to other countries suggesting that similar programs could be worthwhile pursuing.

Sponsorship

The project was sponsored by Boehringer Ingelheim Denmark A/S and Pfizer Denmark ApS.

Conflicts of interest

Peter Lange has been receiving honorarium for work done in connection with the design of the project and data analysis. He has been a member of advisory boards for Boehringer Ingelheim, Pfizer, GSK and AstraZeneca and has received honoraria for lectures for the abovementioned companies.

Erik Munch has been receiving honorarium for work done in connection with the design of the project and data analysis. He has been a member of advisory boards for Boehringer Ingelheim and Pfizer.

Tina Brandt Sørensen has been receiving honorarium for work done in connection with the design of the project and data analysis. She has been a member of advisory boards for Boehringer Ingelheim, Pfizer and AstraZeneca and has received honoraria for lectures for the abovementioned companies.

Jens Dollerup is an employee at Pfizer.

Kirsten Kassø and Hanne Bormann Larsen are employees at Boehringer Ingelheim.

Klaus Kaae Andersen. Has been receiving honorarium for work done in connection with the data administration, statistical analysis in the KOLIBRI study and other project with the pharmaceutical industry (company names).

Ronald Dahl has been receiving honorarium for work done in connection with the design of the project and data analysis. He has been a member of advisory boards for Boehringer Ingelheim, Pfizer, GSK, AstraZeneca and has received honoraria for lectures for the abovementioned companies.

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